

Claims

We claim:

1. An organic light emitting diode (OLED), comprising:
- a universal host;
  - a hole transporting layer;
  - an electron transport layer;
- wherein said hole transporting layer and said electron transport layer are on opposing sides of said universal host, and are in electrical contact with said universal host; wherein said hole transporting layer, said electron transport layer, and said universal host together comprise an active portion of said OLED; electrodes on opposing sides of said active portion for providing a bias across said active portion; wherein at least one of said electrodes is transparent.
2. The OLED of claim 1, wherein said universal host is a material adapted to emit at wavelengths in the blue visible light region or shorter.
3. The OLED of claim 1, wherein said universal host is doped with a red emitting material.
4. The OLED of claim 3, wherein said universal host comprises 5,5'-bis(dimesitylboryl)-2,2'-bithiophene, and wherein said red emitting material is 6,13-diphenylpentacene.
5. The OLED of claim 1, wherein said universal host is doped with a green emitting material.
6. The OLED of claim 5, wherein said universal host material is 5,5'-bis(dimesitylboryl)-2,2'-bithiophene, and wherein said green emitting material is N,N'-diethylquinacridone.
7. The OLED of claim 1, wherein said universal host is doped with a blue emitting material.
8. The OLED of claim 1, wherein said hole transporting layer is 4,4-bis(1-naphthylphenyl-amino)biphenyl.

- 1 9. The OLED of claim 1, wherein said electron transport layer is 5,5'-bis(dimesitylboryl)-2,2'-  
2 bithiophene.  
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4 10. The OLED of claim 1, wherein at least one of said transparent electrodes comprises a glass  
5 substrate coated with a transparent anode material.  
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7 11. The OLED of claim 10, wherein said transparent anode material is indium tin oxide.  
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9 12. The OLED of claim 1, wherein one of said electrodes comprises a metallic cathode.  
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11 13. The OLED of claim 1, wherein said metallic cathode comprises an alloy of Mg and Ag.  
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13 14. The OLED of claim 1, wherein a hole blocking layer is inserted between said universal host  
14 and said electron transport layer, and wherein said hole blocking layer, said hole transporting  
15 layer, and said electron transport layer are in electrical contact with said universal host;  
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17 15. The OLED of claim 1, wherein said hole blocking layer comprises bathocuproine.  
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19 16. An organic light emitting diode (OLED), comprising:  
20 a hole transporting layer;  
21 an electron transport layer that is also a universal host;  
22 wherein said hole transporting layer and said electron transport layer are placed in series,  
23 and are in electrical contact with each other;  
24 wherein said hole transporting layer and said electron transport layer together comprise  
25 an active portion of said OLED;  
26 electrodes on opposing sides of said active portion for providing a bias across said active  
27 portion;  
28 wherein at least one of said electrodes is transparent.  
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30 17. The OLED of claim 16, wherein said electron transport layer is a material adapted to emit at  
31 wavelengths in the blue visible light region or shorter.  
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1 18. The OLED of claim 16, wherein said electron transport layer is doped with a red emitting  
2 material.

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4 19. The OLED of claim 18, wherein said red emitting material is 6,13-diphenylpentacene.

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6 20. The OLED of claim 16, wherein said electron transport layer is doped with a green emitting  
7 material.

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9 21. The OLED of claim 20, wherein said green emitting material is N,N'-diethylquinacridone.

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11 22. The OLED of claim 16, wherein said electron transport layer is doped with a blue emitting  
12 material.

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14 23. The OLED of claim 16, wherein said hole transporting layer is 4,4-bis(1-naphthylphenyl-  
15 amino)biphenyl.

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17 24. The OLED of claim 16, wherein said electron transport layer is 5,5'-bis(dimesitylboryl)-  
18 2,2'-bithiophene.

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20 25. The OLED of claim 16, wherein at least one of said transparent electrodes comprises a glass  
21 substrate coated with a transparent anode material.

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23 26. The OLED of claim 25, wherein said transparent anode material is indium tin oxide.

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25 27. The OLED of claim 16, wherein one of said electrodes comprises a metallic cathode.

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27 28. The OLED of claim 16, wherein said metallic cathode comprises an alloy of Mg and Ag.

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29 29. An organic light emitting diode (OLED), comprising:

30 a hole transporting layer that is also a universal host;

31 an electron transport layer;

32 wherein said hole transporting layer and said electron transport layer are placed in series,

1 and are in electrical contact with each other;  
2 wherein said hole transporting layer and said electron transport layer together comprise  
3 an active portion of said OLED;  
4 electrodes on opposing sides of said active portion for providing a bias across said active  
5 portion;  
6 wherein at least one of said electrodes is transparent.

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8 30. The OLED of claim 29, wherein said hole transporting layer is a material adapted to emit at  
9 wavelengths in the blue visible light region or shorter.

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11 31. The OLED of claim 29, wherein said hole transporting layer is doped with a red emitting  
12 material.

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14 32. The OLED of claim 31, wherein said red emitting material is 6,13-diphenylpentacene.

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16 33. The OLED of claim 29, wherein said hole transporting layer is doped with a green emitting  
17 material.

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19 34. The OLED of claim 33, wherein said green emitting material is N,N'-diethylquinacridone.

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21 35. The OLED of claim 29, wherein said hole transporting layer is doped with a blue emitting  
22 material.

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24 36. The OLED of claim 29, wherein said hole transporting layer is 4,4-bis(1-naphthylphenyl-  
25 amino)biphenyl.

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27 37. The OLED of claim 29, wherein said electron transport layer is 5,5'-bis(dimesitylboryl)-  
28 2,2'-bithiophene.

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30 38. The OLED of claim 29, wherein at least one of said transparent electrodes comprises a glass  
31 substrate coated with a transparent anode material.  
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1 39. The OLED of claim 38, wherein said transparent anode material is indium tin oxide.

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3 40. The OLED of claim 29, wherein one of said electrodes comprises a metallic cathode.

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5 41. The OLED of claim 29, wherein said metallic cathode comprises an alloy of Mg and Ag.  
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